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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/728,987	12/08/2003	Akiharu Miyanaga	740756-2681	1100

22204 7590 07/05/2005

NIXON PEABODY, LLP  
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WASHINGTON, DC 20004-2128

EXAMINER
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MARKHAM, WESLEY D

ART UNIT	PAPER NUMBER
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1762

DATE MAILED: 07/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/728,987

Applicant(s)

MIYANAGA ET AL.

Examiner

Wesley D. Markham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 April 2005 and 16 June 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 2-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 December 2003 and 30 August 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☒ Certified copies of the priority documents have been received in Application No. 08/426,483.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>4/11/05</u> .   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application on 4/11/2005 after final rejection.

Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action (mailed on 12/9/2004) has been withdrawn pursuant to 37 CFR 1.114. Applicant's submissions filed on 4/11/2005 and 6/16/2005 have been entered.

### ***Response to Amendment***

2. Acknowledgement is made of the amendments filed by the applicant on 4/11/2005 (along with the RCE) and 6/16/2005 (in response to a notice of non-compliant amendment), in which the specification of the instant application was amended, Claims 2, 4, 6, 8, 10, 13, and 16 – 18 were amended, and Claims 21 – 24 were added. **Claims 2 – 24** are currently pending in U.S. Application Serial No. 10/728,987, and an Office action on the merits follows.

***Information Disclosure Statement***

3. The IDSs filed by the applicant on 4/11/2005 are acknowledged, and the references listed thereon have been considered by the examiner as indicated on the attached copies of the PTO-1449 forms.

***Drawings***

4. The objection to the drawings set forth in paragraph 4 of the previous Office action is withdrawn in light of the applicant's amendment to properly identify the reference characters in the specification. As such, the drawings filed on 12/8/2003 (one sheet showing Figures 2A and 2B) and 8/30/2004 (four sheets showing Figures 1, 3A – 3C, 4, 5, and 6A – 6C) are approved by the examiner.

***Claim Objections***

5. The objection to Claim 20 (as being a duplicate of Claim 17) set forth in paragraph 8 of the previous Office action is withdrawn in light of the applicant's amendment to depend Claim 17 from Claim 16 instead of Claim 18.
6. **Claim 21** is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim (i.e., Claim 2). Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Specifically, Claim 21 recites that the film comprises a material selected from the group consisting of carbon, DLC, i-carbon, metal, and insulating ceramics, but Claim 2 (from which Claim 21 depends) appears to require that the film be ceramic. As

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such, Claim 21 is open to films (e.g., metal films) that are not "ceramic", and the claim does not further limit Claim 2.

***Claim Rejections - 35 USC § 112***

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. The rejection of Claims 8, 9, and 17 – 20 under 35 U.S.C. 112, first paragraph, set forth in paragraphs 10 and 11 of the previous Office action, is withdrawn in light of the applicant's amendment to independent Claims 8 and 18. Claims 8 and 18 now require that the power value of the pulsed electromagnetic wave be higher than the power value of the continuous electromagnetic wave.
9. **Claims 2 – 24** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, all the independent claims in the instant application (Claims 2, 4, 6, 8, 10, 13, 16, and 18) were amended to require, in part, "wherein said reactive gas is introduced into said reaction chamber in a direction toward the surface of the object". The examiner has reviewed the

specification as originally filed and finds no support, either explicit, implicit, or inherent, for the aforementioned claimed limitation in the context of the claimed invention. The relevant portion of the specification simply discloses that "a reacting material (which forms a solid upon decomposition and reaction) in the form of a gas, liquid, or solid, such as a hydrocarbon gas...is introduced at a flow rate of 20 SCCM." The rest of the specification does not discuss the direction at which the reactive gas is introduced into the reaction chamber. As such, there is no teaching or suggestion of introducing the reactive gas into the chamber in a direction toward the surface of the object, as required by Claims 2 – 24.

10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. **Claims 2 – 24** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

12. Specifically, all the independent claims in the instant application (Claims 2, 4, 6, 8, 10, 13, 16, and 18) were amended to require, in part, "wherein said reactive gas is introduced into said reaction chamber in a direction toward the surface of the object". The examiner has reviewed the applicant's specification and finds no disclosure or discussion of the aforementioned limitation. It is unclear what gas flow directions the applicant intends to encompass by reciting that the gas is introduced into the

chamber "in a direction toward the surface of the object", thereby rendering the scope of the claims unclear. For example, does introducing a reactive gas parallel to the upper surface of a substrate such that the gas flows across the substrate constitute introducing the gas "in a direction toward the surface of the object"? Does introducing gas below the substrate such that it flows around the substrate and to the surface of the substrate constitute introducing the gas "in a direction toward the surface of the object"? The examiner notes that all vapor deposition processes in which the substrate is located in a reaction chamber require the reactant/gas/vapor to contact the substrate – otherwise, a film would not be deposited on the substrate. It is unclear how the limitation of introducing the gas "in a direction toward the surface of the object" distinguishes the claims from any vapor deposition process in which the gas is introduced into the chamber and subsequently contacts the substrate. Absent any teaching in the specification of what is encompassed by the aforementioned limitation, one skilled in the art would not be reasonably apprised of what gas introduction direction(s) / pattern(s) are encompassed by the "in a direction toward the surface of the object" limitation, thereby rendering the scope of the claims unclear.

### ***Double Patenting***

13. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a

patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969). A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b). Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

14. **Claims 2 – 24** are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1 – 19 of U.S. Patent No. 6,660,342 (Miyanaga et al.) in view of Matsuo et al. (USPN 4,401,054). Although the conflicting claims are not identical, they are not patentably distinct from each other because Claims 1 – 19 of U.S. Patent No. 6,660,342 teach the limitations of Claims 2 – 24 of the instant application, including the steps of introducing a reactive gas into a reaction chamber, applying a pulsed EM wave (e.g., microwave) to the reactive gas to convert the gas into a plasma, applying a continuous EM wave to the reactive gas so that the continuous EM wave is superposed on the pulsed EM wave, and forming a film on a surface of an object in the reaction chamber, wherein (1) a



power value of the pulsed EM wave is greater than a power value of the continuous EM wave, (2) the frequency of the pulsed EM wave is either the same as or different from the frequency of the continuous EM wave, and (3) a magnetic field is applied to perform ECR in the chamber. The method of Claims 1 – 19 of U.S. Patent No. 6,660,342 is used to produce films of materials such as aluminum oxide and zirconia (ceramics), films of a material selected from the group consisting of tungsten, titanium, and molybdenum, and a silicide thereof (i.e., "metallic films"), and carbon / DLC films (see Claims 2, 4, 5, 7, 8, 10, 12, 13, 15, 16, and 18 of 6,660,342 for the appropriate film material teachings), as claimed by the applicant. Claims 1 – 19 of '342 do not explicitly teach introducing the reactive gas into the reaction chamber in a direction toward the surface of the object. Specifically, Claims 1 – 19 of '342 are silent as to the direction of reactive gas introduction. However, Matsuo et al. teaches that, in the art of depositing a film on an object by plasma deposition (i.e., a process analogous to that of the claims of '342), the reactive gas is introduced into the chamber through a pipe that directly guides the gas toward the surface of the substrate (Figure 3, Col.6, lines 42 – 54). Therefore, it would have been obvious to one of ordinary skill in the art to introduce the reactive gas of Claims 1 – 19 of '342 into the chamber directly toward the surface of the substrate, as taught by Matsuo et al., in order to reap the expected benefits of doing so (e.g., insuring that the gas reaches the substrate to deposit the film thereon, limiting the amount of wasted reactant gas that does not reach the substrate, etc.).

15. **Claims 2 – 24** are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1 – 15 of U.S. Patent No. 5,626,922 (Miyanaaga et al.) in view of Matsuo et al. (USPN 4,401,054). Although the conflicting claims are not identical, they are not patentably distinct from each other because Claims 1 – 15 of U.S. Patent No. 5,626,922 teach a “plasma processing” method including the steps of introducing a reactive gas into a reaction chamber, applying a pulsed EM wave (e.g., microwave – see Claims 2 and 9) to the reactive gas to convert the gas into a plasma, and applying a continuous EM wave to the reactive gas so that the continuous EM wave is superposed on the pulsed EM wave, wherein (1) a power value of the pulsed EM wave is greater than a power value of the continuous EM wave, and (2) the frequency of the pulsed EM wave is different from the frequency of the continuous EM wave (see Claims 9, 12, and 15). While independent Claims 9, 12, and 15 do not explicitly teach that the “plasma processing” includes depositing an insulating ceramic film or a metallic film on a substrate in the chamber, Claims 3 and 4 of 5,626,922 clearly teach that such a plasma film (e.g., metallic or insulating ceramic) forming process is considered to be within the genus of “plasma processing” envisioned by Claims 1 – 15 of 5,626,922. Therefore, it would have been obvious to one of ordinary skill in the art to utilize the method recited in Claims 9, 12, and 15 of 5,626,922 to deposit an oxide (i.e., insulating ceramic) or tungsten, titanium, or molybdenum (i.e., metallic) film, as taught by Claims 3 and 4, because such a plasma film deposition process fulfills the generic “plasma processing” requirement of Claims 9, 12, and 15 in a manner clearly

envisioned by the claims of 5,626,922. Claim 6 of '922 also teaches that a pulsed magnetic field is applied to the chamber, and as such, it would have been obvious to one of ordinary skill in the art to apply such a field in order to promote the plasma processing of the substrate (i.e., due to the resonance – ECR – conditions achieved by pulsing a magnetic field in a plasma process). Regarding the limitation that the frequencies of the pulsed EM wave and the continuous EM wave are the same (as required by Claims 6, 7, and 16 of the instant application), the claims of 5,626,922 appear to be open to both situations in which the frequencies are the same and in which the frequencies are different. As such, absent any showing of criticality or unexpected results, it would have been obvious to one of ordinary skill in the art to utilize either the same frequency or different frequencies for the pulsed and the continuous EM waves with the reasonable expectation of success and obtaining similar results. Claims 1 – 15 of '922 do not explicitly teach introducing the reactive gas into the reaction chamber in a direction toward the surface of the object. Specifically, Claims 1 – 15 are silent as to the direction of reactive gas introduction. However, Matsuo et al. teaches that, in the art of depositing a film on an object by plasma deposition (i.e., a process analogous to that of the claims of '922), the reactive gas is introduced into the chamber through a pipe that directly guides the gas toward the surface of the substrate (Figure 3, Col.6, lines 42 – 54). Therefore, it would have been obvious to one of ordinary skill in the art to introduce the reactive gas of Claims 1 – 15 of '922 into the chamber directly toward the surface of the substrate, as taught by Matsuo et al., in order to reap the expected benefits of doing

so (e.g., insuring that the gas reaches the substrate to deposit the film thereon, limiting the amount of wasted reactant gas that does not reach the substrate, etc.).

16. **Claims 2 – 9 and 21 – 24** are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 31 – 83 of U.S. Patent No. 6,110,542 (Miyanaga et al.) in view of Matsuo et al. (USPN 4,401,054). Although the conflicting claims are not identical, they are not patentably distinct from each other because Claims 31 – 83 of U.S. Patent No. 6,110,542 teach the limitations of Claims 2 – 9 and 21 – 24 of the instant application, including the steps of introducing a reactive gas into a reaction chamber, applying a pulsed EM wave (e.g., microwave) to the reactive gas to convert the gas into a plasma, applying a continuous EM wave to the reactive gas so that the continuous EM wave is superposed on the pulsed EM wave, and forming a film on a surface of an object in the reaction chamber, wherein (1) a power value of the pulsed EM wave is greater than a power value of the continuous EM wave, (2) the frequency of the pulsed EM wave is either the same as or different from the frequency of the continuous EM wave, and (3) a magnetic field is applied to perform ECR in the chamber. The method of Claims 31 – 83 of U.S. Patent No. 6,110,542 is used to produce carbon / DLC / diamond films, as claimed by the applicant in new Claims 21 – 24. Claims 31 – 83 of '542 do not explicitly teach introducing the reactive gas into the reaction chamber in a direction toward the surface of the object. Specifically, Claims 31 – 83 of '542 are silent as to the direction of reactive gas introduction. However, Matsuo et

al. teaches that, in the art of depositing a film on an object by plasma deposition (i.e., a process analogous to that of the claims of '342), the reactive gas is introduced into the chamber through a pipe that directly guides the gas toward the surface of the substrate (Figure 3, Col.6, lines 42 – 54). Therefore, it would have been obvious to one of ordinary skill in the art to introduce the reactive gas of Claims 31 – 83 of '542 into the chamber directly toward the surface of the substrate, as taught by Matsuo et al., in order to reap the expected benefits of doing so (e.g., insuring that the gas reaches the substrate to deposit the film thereon, limiting the amount of wasted reactant gas that does not reach the substrate, etc.).

### ***Response to Arguments***

17. Applicant's arguments filed on 4/11/2005 have been fully considered but they are not persuasive. Specifically, the applicant's arguments are moot in view of the new grounds of rejection presented above.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Matsuo et al. (USPN 4,564,997) is cited to show a plasma deposition process in which the plasma gas is conveyed in a direction perpendicular to the substrate surface in order to obtain various benefits (see Claim 1).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D. Markham whose telephone number is (571)

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272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



WDM

Wesley D Markham  
Examiner  
Art Unit 1762



TIMOTHY MEEKS  
SUPERVISORY PATENT EXAMINER